

G E U S

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LULITA-2

**Conventional core analysis for Mærsk Olie og
Gas A/S**

Well: Lulita-2, spectral core gamma log

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**Conventional Core Analysis
for Mærsk Olie og Gas A/S**

Well: Lulita - 2,
Spectral core gamma log

GEUS Core Laboratory

Gert Andersen

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1. Introduction

By request of Mærsk Olie og Gas AS, GEUS Core Laboratory has performed conventional core analysis on the well Lulita-2.

The analytical programme was specified by Mr. John Wham in contract work order CWO 0148 dated May 04, 1998. The following services were specified:

- Spectral core gamma log
- Core preservation

GEUS Core Laboratory received 85 core boxes from Lulita-2 on April 30, May 5 and 13, 1998. Preliminary core logs have been forwarded to Mærsk Olie og Gas on May 12 and 15, 1998.

2. Analytical procedure

The laboratory received 240 feet of Middle Jurassic sandstone core from Lulita-2 taken in the interval 15.010,00 - 15.682,00 feet measured depth. The 10 cm diameter cores were contained in boxes of approximately 3 feet. Following the core scanning, the cores were slabbed and a cut was preserved and labelled in metal trays.

2.1 Spectral core gamma log

A spectral gamma log of the cores was recorded using a scanning speed of 1 cm per minute. All data were later adjusted for an average activity from the background.

2.2 List of core boxes for Lulita-2

Core no. 1: 15.010,00 - 15.070,00 feet.

Box	Depth [Feet]
1	15.010,00-15.012,50
2	15.012,50-15.015,50
3	15.015,50-15.018,50
4	15.018,50-15.021,50
5	15.021,50-15.024,50
6	15.024,50-15.027,50
7	15.027,50-15.030,50
8	15.030,50-15.033,50
9	15.033,50-15.036,50
10	15.036,50-15.039,67
11	15.039,67-15.042,50
12	15.042,50-15.045,50
13	15.045,50-15.048,50
14	15.048,50-15.051,50
15	15.051,50-15.054,50
16	15.054,50-15.057,50
17	15.057,50-15.060,50
18	15.060,50-15.063,50
19	15.063,50-15.066,50
20	15.066,50-15.069,67
21	15.069,67-15.070,00

Core no. 2: 15.220,00 - 15.274,75 feet.

Box	Depth [Feet]
1	15.220,00-15.222,50
2	15.222,50-15.225,50
3	15.225,50-15.228,50
4	15.228,50-15.231,42
5	15.231,42-15.234,42
6	15.234,42-15.237,42
7	15.237,42-15.240,33
8	15.240,33-15.242,92
9	15.242,92-15.243,92
10	15.243,92-15.246,50
11	15.246,50-15.249,50
12	15.249,50-15.252,50
13	15.252,50-15.255,50
14	15.255,50-15.258,50
15	15.258,50-15.261,50
16	15.261,50-15.264,50
17	15.264,50-15.267,50
18	15.267,50-15.270,50
19	15.270,50-15.273,08
20	15.273,08-15.274,75

Core no. 3 15.279,00 - 15.336,25 feet.

Box	Depth [Feet]
1	15.279,00-15.281,50
2	15.281,50-15.284,50
3	15.284,50-15.287,50
4	15.287,50-15.290,50
5	15.290,50-15.293,50
6	15.293,50-15.296,50
7	15.296,50-15.299,50
8	15.299,50-15.302,50
9	15.302,50-15.305,42
10	15.305,42-15.307,50
11	15.307,50-15.310,50
12	15.310,50-15.313,50
13	15.313,50-15.316,50
14	15.316,50-15.319,50
15	15.319,50-15.322,50
16	15.322,50-15.325,50
17	15.325,50-15.328,50
18	15.328,50-15.331,50
19	15.331,50-15.333,00
20	15.333,00-15.336,25

Core no. 4: 15.610,00 - 15.629,92 feet.

Box	Depth [Feet]
1	15.610,00-15.612,50
2	15.612,50-15.615,50
3	15.615,50-15.618,50
4	15.618,50-15.621,50
5	15.621,50-15.624,50
6	15.624,50-15.627,50
7	15.627,50-15.629,92

Core no. 5: 15.634,00 - 15.636,50 feet.

Box	Depth [Feet]
1	15.634,00-15.636,50
2	15.636,50-15.639,50
3	15.639,50-15.642,50
4	15.642,50-15.645,50
5	15.645,50-15.648,50
6	15.648,50-15.651,50
7	15.651,50-15.654,50
8	15.654,50-15.657,50
9	15.657,50-15.660,50
10	15.660,50-15.663,50
11	15.663,50-15.666,50
12	15.666,50-15.669,50
13	15.669,50-15.672,50
14	15.672,50-15.675,50
15	15.675,50-15.678,50
16	15.678,50-15.681,50
17	15.681,50-15.682,00

3. Analytical methods

The following is a short description of the methods used by the GEUS Core Laboratory. For a more detailed description of methods, instrumentation and principles of calculation the reader is referred to API recommended practice for core analysis procedure (API RP 40, 1960).

3.1 Spectral core gamma log

The natural gamma radiation of a core is recorded within an energy window of 0.5 - 3.0 MeV, using Tl activated NaI scintillation detectors (Bicron), connected to a multichannel analyzer (Canberra).

The core is passed through a lead shielded tunnel at constant speed, with the gamma activity being continuously recorded. Refer to chapter 2 for the scanning speed used. The integrated gamma activity is recorded at regular intervals in this case every 3". The gamma activity represents the mean activity over a 3" interval, the assigned depth being the middle of the interval. The measured gamma activity is corrected for background activity, and in the case of sleeved core, also for activity of the sleeve. Gamma activity is normally reported in counts per minute (cpm) at the actual core diameter. The following empirical relationship between "GAPI" from wireline logs and the actual cpm from GEUS core gamma logs (GEUS-cpm) has been established. The relationship should be used as a guideline only:

$$\text{GAPI} = \text{GEUS-cpm} * (10\text{cm}/d)^2 / 18,2 ; \text{ where } d \text{ is the nominal core diameter in cm.}$$

Radiation from decay of potassium and the uranium and thorium decay series are recorded in separate energy windows. Concentrations are calculated using synthetical standards of concrete doped with radioactive minerals in decay equilibrium. Concentrations of K, U and Th are reported as % K, ppm U and ppm Th, respectively. Relevant ratios are given.

3.2 Precision of analytical data

The reproducibility (precision) of the total gamma activity analysis is calculated from counting statistics. The following list shows the dependency of reproducibility on count rate at the 2 standard deviation level.

Count rate (cpm)	Reproducibility (cpm)
125	8.1
250	11.5
500	16.3
1000	23.0
2000	32.6
4000	46.1

Reproducibility (precision) of the amount of uranium, thorium and potassium from gamma radiation is dependent on concentration. Two values for reproducibility are given, one for normal to high concentration range, and one for low concentration range. The latter also defines the detection limit (LLD). The reproducibility values are applicable to total gamma activity above and below 800 cpm, respectively.

	K(%)	U(ppm)	Th(ppm)
Reproducibility			
Normal to high range	0.13	0.98	1.61
Low range (LLD)	0.02	0.31	0.33
Accuracy	0.04	0.32	0.39

Accuracy is calculated as mean deviation from the accepted concentration of one internal standard. This value is only applicable to low concentrations. For high concentrations the high range reproducibility may serve as an approximation to accuracy. Accuracy is reported as an arithmetic mean.

4. Results of spectral core gamma log

The spectral core gamma log is included with the report and present plots of:

- Depth vs. Th/K
- Depth vs. Th/U
- Depth vs. U/K
- Depth vs. Thorium
- Depth vs. Uranium
- Depth vs. Potassium
- Depth vs. Total gamma log

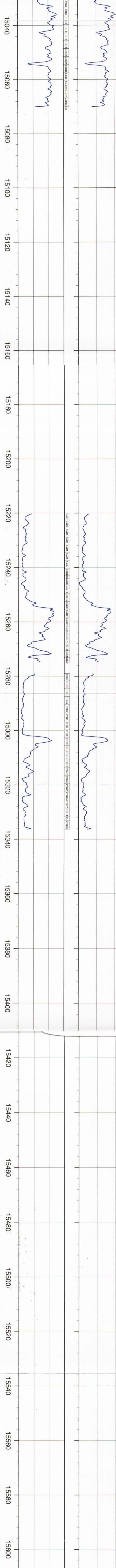
A diskette with the data written in ASCII format is included with the report

Well: Lulita-2

Core: 1-5

Spectral core gamma log

Depth vs.

Th/K
Th/UU/K
Thorium
UraniumPotassium
Total Gamma

*The Geological Survey of Denmark and Greenland
(GEUS) is a research and advisory institution in
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